Int. J. Indust. Entomol. Vol. 15, No. 1, 2007, pp. 79~82

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International Journal of *Industrial Entomology*

Evaluation of Lac Cultivation in Two South-Western Districts of Bangladesh

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(Received July 23 2007; Accepted August 27 2007)

Lac is the dermal secretion of lac insect, *Kerria lacca* Kerr., which is used to make expensive natural dye, burnish, coating materials, in cosmetics and jewelry industry. Though it is very perspective industry and available of host plants over the country especially in southern districts of Bangladesh, lac cultivation is confined within some northern districts of Bangladesh. Experiment was conducted to find out the possibility of lac cultivation in two southwestern districts of Bangladesh: Khulna and Satkhira compared to Chapainowabgonj, the key lac producing district in Bangladesh, during February-October, 2006. The bark thickness, bark weight of ber plant, ratio of harvested and inoculated lac sticks, harvested raw lac, and harvested processed lac were measured and compared. Statistically, similar performance of lac cultivation was found regarding all parameters in three districts. These results recommended that lac cultivation is possible at the south-western coastal part of Bangladesh.

Key words: Lac sticks, Raw lac, Shellac, Turi.

Introduction

Lac, the resinous exudation, is secreted from the dermal glands as protective covering by tiny lac insect *Kerria lacca* (Kerr), Homoptera: Coccoidea: Lacciferidae (Rahaman *et al.,* 2001). Lac insect encircles the dermal secretion to the outside-buckles of the host plant shoots for its shelter which form a hard continuous encrustation over the shoots (Alam and Sarker, 2000). The encrustations are later scrapped off, dried and processed to get the commercial lac. Lac is widely used for the multipurpose activities, e.g. produce different sorts of dyes, burnishes, and painting materials, as a polish of skin and hides, non-conducting burnish agents in power industries, as filling materials in jewelry industry and as coating materials of steamers, ships etc, to make sex pheromone and medicine, in the weapon industries, to make toys, nail polish, dry-mounting tissue paper etc. (Alam and Sarker, 2000).

Plant species on which lac insect can survive by taking different privileges is known as host. Different host plants for lac cultivation are ber, *Zizyphus jujuba*, palas, *Butea frondosa*, kusum, *Schleichera trijuga*, khair, *Acacia catechu*, babla, *Acacia arabica*, and mehgonia, *Mehgania macrophylla*, Sirish, *Albizzia lebbek* etc (Rahaman *et al.,* 2001). For cultivating lac, most emphasis is given to ber, *Zizyphus jujuba* as host plant in the lac growing areas of Bangladesh as the rate of production is more than that of other host species (Ali *et al.,* 1975, 1976 and 1979). From a 7-8 years aged ber plant, beside ber production it is possible to earn 1500 BDT (25 USD). Lac, such a lucrative culture has a great demand and wide possibilities not only in Bangladesh but also all over the world. However, in Bangladesh, the lac culture is confined around Chapainowabgonj, one of the Northern districts, though most of the areas of Bangladesh are favorable for its production (Alam and Sarker, 2000). About 1200 Metric ton of processed lac is necessary for consumption in Bangladesh. Every year about 300 hectares of land is used for cultivation that can produce only 180 Metric Tons, (Alam and Sarker, 2000) which cannot fulfill the domestic demand. Moreover, temperate countries do not possess the favorable climate for lac cultivation. But they have vast use of lac. So, we have golden opportunity to produce and export lac. In this south-western coastal area, lac cultivation has not been introduced yet, but it has wide possibilities in this region due to many reasons. In the southwestern districts

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almost everywhere there are available host plants on which lac insect grow. The more lac productive host species is ber (*Zizyphus jujuba*), which is natural in this area (Rahaman *et al.*, 2001). Therefore it will be one of the best practices in this area if this is commenced on available host species. In southwestern region of Bangladesh, a lot of farmers have either a small piece of land or not at all like many other regions of Bangladesh. So they are transmitting to other odd occupations like rickshaw pulling, handy working or day laboring etc. If lac cultivation is introduced in this regions, they will help those farmers economically, which can support their family. This will do an extra support to their family income. Lac production costs only three month. In the southwestern region (Sathkhira, Khulna and Bagerhat district mainly) hectares of land are used for the shrimp and prone culture. But the isles are kept useless for maximum time. Host plants and lac are cultivated then extra currency will support to the commerce of shrimp and prone farming. So, lac cultivation might be an ideal practice in this area with the maximum utilization of resources by the integrated farming system. To cultivate lac in southwestern region of Bangladesh it is necessary to study thoroughly. Therefore, the study was undertaken to evaluate the possibility of lac cultivation in southwestern region.

Materials and Methods

The experiments were conducted to study the possibilities of lac cultivation in two south-western districts of Bangladesh: Khulna and Satkhira, compared to Chapainwabganj, the major lac producing district in Bangladesh and at the plant protection laboratory of Khulna University during February-October, 2006. The experiments were laid on Randomized Complete Block Design (RCBD) with three treatments (districts) and five replications (host plants). Five healthy, moderately young ber plants were selected as host in each district on which inoculation of nymphs was done. The plants were selected maintaining short distance from one another to minimize microclimatic differences. In February 2006, the selected ber plants were pruned from the base of the shoots so that new succulent shoots came out which is favourable for lac insects (Rahaman *et al.*, 2001). On 22 July 2006, brood lac sticks consisting mature nymphs were collected from Lac Research Station, Chapainowabgonj, which were healthy, well matured and free from harmful insect and diseases. Brood lac sticks were tied up with the succulent shoots of the host plants both horizontally and vertically so that the nymphs could settle on the new succulent shoots. After one week of inoculation when nymphs were settled onto shoots, brood lac sticks were removed from hosts.

After one month of inoculation 3 shoots from each plant with 5 cm length and 1.2 cm diameter were cut and brought to laboratory to measure the thickness of bark and weight of bark. The thickness of bark was measured by slide calipers. Bark weights were taken by electric balance.

After 80 days of inoculation when the young nymphs had came out from the mother cells the lac sticks were harvested with a sharp knife cut into small sticks of 30 cm in length. Fifty sticks were tied to make turi and kept in dark place. Before making the turi, the individual harvested sticks per plant were counted to calculate the harvested lac sticks against inoculated sticks.

Lac was separated manually with a sharp knife by scrapping them from the sticks. The scrapped lac with other foreign materials for the individual plant was measured by a balance in gm. Then lac was washed with clean water for three to four times to clean the lac more precisely. Furthermore, they were dried in the sun until they become friable, water free and good color. Polythene paper bag was used to preserve the lac. After that the fresh lac was measured with electric balance separately and the yield was recorded individually for each plant. The ratio of inoculated and harvested lac sticks was calculated in percentage. The weight of raw and processed lac were measured by a top balance. Data were analyzed by using MSTAT-C software in computer.

Results

In the present experiment the bark thickness; bark weight; ratio of inoculated and harvested lac sticks; weight of harvested raw lac; weight processed lac were studied at Khulna, Satkhira and Chapainowabgonj districts. There was no significant difference of bark thickness among three study areas. However, numerically thickest bark was found at Satkhira (0.100 cm) followed by Khulna (0.099 cm) and the lowest (0.095 cm) was in Chapainowabgonj (Table 1).

Table 1. Bark thickness of host plants during lac production at three districts of Bangladesh

Districts	Bark Thickness (cm)
Khulna	0.099
Satkhira	0.100
Chapainowabgonj	0.095
Level of significance	NS

NS: Not-significant
Sample length 5 cm and sample diameter 1.2 cm

Table 2. Bark weight of host plants during lac production at three districts of Bangladesh

Location	Bark Weight (gm)
Khulna	3.377
Satkhira	3.444
Chapainowabgonj	3.254
Level of significance	NS

NS: Not-significant;
Sample length 5 cm and sample diameter 1.2 cm

Table 3. Ratio of harvested and inoculated lac sticks at three districts of Bangladesh

Location	Ratio of Harvested lac sticks per inoculated lac sticks
Khulna	6.708
Satkhira	6.378
Chapainowabgonj	6.360
Level of significance	NS

NS: Not-significant
Each lac stick length: 30 cm

Table 4. Weight of harvested raw lac at three districts of Bangladesh

Location	Weight of harvested raw lac/stick (g)
Khulna	117.232
Satkhira	102.440
Chapainowabgonj	105.144
Level of significance	NS

NS: Not-significant
Each lac stick length: 30 cm

Table 5. Weight of processed lac at three districts of Bangladesh

Location	Weight of processed raw lac/ stick (g)
Khulna	88.276
Satkhira	74.830
Chapainowabgonj	96.360
Level of significance	NS

NS: Not-significant
Each lac stick length: 30 cm

In respect to bark weight, there was similar result considering three districts. Mean bark weight of ber plant at Khulna, Satkhira and Chapainowabgonj regions ranged from 3.254 g to 3.377 g (Table 2) which was statistically not-significant. The heaviest bark weight was found at Khulna University location (3.377 g) whereas the lightest bark was found in Chapainowabgonj (3.254 g).

Of the three locations, ratio of harvested and inoculated lac sticks was measured and was found non-significant result (Table 3). Among these locations, in respect to ratio of inoculated and harvested lac sticks, Khulna showed highest performance noticing 6.708 times harvested lac sticks against single inoculated lac stick. In Satkhira, the performance was medium where the harvested lac stick was 6.378 times of inoculated stick. Chapainowabgonj was the location showed the lowest performance providing 6.360 times harvested lac sticks against inoculated lac sticks.

The data on harvested raw lac differed insignificantly at three locations. Here, Khulna showed better performance (117.232 g) on the basis of harvested raw lac. However, Satkhira showed the lowest (102.440 g). The middle position was performed by Chapainowabgonj noticing 105.144 g harvested raw lac.

The weight of processed lac in the three locations was not significantly differed (Table 5). The highest amount was obtained at Chapainowabgonj (96.360 g) and at Satkhira was lowest (74.830 g).

Discussion

In respect of all the parameters, there were no significant differences which were expected according to the objectives of the study. The result of bark thickness and bark weight of host of this experiment is in accordance with the study conducted by Rahaman *et al.* (2002). According to his study the mean bark thickness for ber plant as a host of *K. lacca* was 0.092 cm which is statistically similar to the findings of the present study. The lac population might be related to the host plant as well as bark thickness of host plant on which *K. lacca* fed. Fengshu *et al.* (1988) reported that the lac insects get nutrition from bark of host trees and the chemical composition of branches influence on the growth of the lac insects. As we got non-significant result it could be advocated that ber plants in Satkhira districts are suitable for lac cultivation.

Considering the ratio of inoculated sticks and harvested lac sticks both in Satkhira district and Khulna district it was found more than 6 times harvested lac sticks against per inoculated lac stick. As a host, a good lac producing ber plant produces 6 times lac sticks (personal communication with Mr. M. M. Rahaman, Principal Scientific Officer, Lac Research Station, Chapainowabgonj). This statement supports the present study where it has non-significant difference among the three districts. Srivastava and Mehra (1998) worked on three plant characters: height, total number of shoots and inoculable shoots and the results also supported present results. So, from the above observation, it could be said that lac production is in

Satkhira and Khulna districts is economically justified too.

Similar performance of lac found considering the harvested raw and processed lac. According to Rahaman et al. (2001), the mean yield of raw lac per stick was 105 g, and in present study it was found similar result (in Khulna 117 g per stick and in Satkhira 102 g per stick) which support the findings of Mishra and Sushil (2000). Therefore, from the above observations it can be said that the environment and ber plants as host in Satkhira and Khulna districts are suitable for lac cultivation and lac cultivation is possible in the south-western region of Bangladesh.

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